CONTENTS

Frozen Ground

Chen. L., Gärtner-Roer I., Vieira G., and Burn, C.R. (eds.) 2025. Frozen Ground 48 (2024). *International Permafrost Association (IPA)*. DOI: 10.52381/IPA.FG482025.1.

Words from the Presidents

As stated by the outgoing IPA President Chris Burn in 2024, the ICOP always marks a transition in the IPA Executive Committee (EC) and with this a change in the organizational structure. So, with great pleasure, honor and sense of responsibility, we took the lead of the IPA in summer 2024, together with Dr Lin Chen, the new Executive Director and a partly new and partly established team.

We thank the generous support of the Chinese Academy of Sciences that funds the IPA secretariat in Lanzhou, building a stable contact point for the IPA in a central region for permafrost research and engineering. Emma Stockton, IPA Executive Director in the past term, helped to make the secretariat transition smooth and swift. Thank you so much for your engagement! And the final heartfelt words of acknowledgement go to Chris Burn, the outgoing president and now past president, to our colleagues in the Executive Committee and to the Council members, who accepted our suggestion of holding a co-presidency for this term. We expect that with this solution, we can contribute to IPA's motto "Fostering permafrost research to the ends of the Earth" and continue paving IPA's path as the key international organization and forum to address permafrost-related issues.

Takhini River valley thaw slump
(Taken by I. Gärtner-Roer on June 11, 2024 at the pre-conference excursion)

With a formal presentation at the Council Meeting at ICOP, the former Action Group on Rock Glacier Inventories and Kinematics (RGIK) became an IPA Standing Committee. The group continues to

coordinate the global compilation and distribution of standardized rock glacier products, and to foster international collaboration and advancement in the understanding of rock glaciers. We thank the entire group for their ongoing activities and commitment!

After the ICOP, the IPA council approved the adhesion of two new country members, Czechia and India, which we warmly welcome into our community! They will become IPA member countries from 2025 onwards.

As one of the first initiatives in our joint presidency, following the suggestion from the IPA Council, we will aim to enhance the communication within the permafrost community. For this, we will be preparing a monthly IPA Newsletter, providing insights on the Association's activities and on permafrost research and engineering events. We hope you will enjoy it and look forward to your contributions to this service.

In the near future, we hope to meet you at the 3rd ACOP in Mongolia (2026), at the ICOP in Italy (2028), or at other regional meetings and workshops. Two major events are ongoing, for which the permafrost community will be asked for contributions and activities: the UN International "Decade of Action for Cryospheric Sciences (2025-34)", as well as the preparation for the International Polar Year (IPY) 2032/33. Permafrost-related issues in reaction to global warming are needing and getting more attention in society and decision-making processes. The IPA as a well-established organization and international network of permafrost researchers and engineers, is at a vantage point to provide contributions to management, policy making, as well as education. As such, the IPA will play an active role on these two landmark events and counts on your involvement and contributions.

As a final word in this beginning of our term, we should say that our kick-off followed an outstanding XII International Conference on Permafrost that took place in Whitehorse from 16 to 20 June 2024. This amazing conference showed how vibrant the community of permafrost researchers and engineers is. It brought to Yukon a breadth of new knowledge from over 600 participants from 28 countries, with Whitehorse becoming that week the gateway for exchange of new ideas on everything frozen-ground related. Besides science, the organizers prepared a number of social events that really brought the community together, literally brewing new collaborations. We have to truly thank the excellent team that made ICOP possible, with special thanks to Ryley Beddoe, Kumari Karunaratne and Lukas Arenson for their incredible dedication to the event and for the way they cared with all the participants requests. The stakes are high for the next ICOP.

With this, and with four challenging years ahead of us, we would like to thank you for your ongoing support and commitment to the IPA. We are always at your disposal.

Isabelle Gärtner-Roer and Gonçalo Vieira

As Isabelle and Gonçalo have noted, the EC changed in Whitehorse with some statutory elections. Leading up to the conference, all Council members were consulted on potential changes to the IPA constitution, so that it is possible for us to have a joint Presidency. The approved resolution still indicates that we prefer a single President, but the joint Presidency is an important alternative that is now available. In 2024 the Council revisited our decision in 2023 to suspend the Russian adhering body and will do so again in December 2025. It is a decision that must be revisited annually because international events can move quickly and in unpredictable ways.

I am very grateful to my Canadian colleagues for organizing such a successful ICOP in Whitehorse. The burden on the organizing committees, both the National Committee and the Local Committee, was considerable and one that few of us who attend these large events appreciate fully until we have been closely involved. I am particularly grateful to Ryley Beddoe for looking after the program, Kumari Karunaratne for handling the Proceedings, and Lukas Arenson for overall supervision. In addition, field excursions have always been part and parcel of our meetings, and in this case, Duane Froese, Fabrice Calmels, Steve Kokelj, and Jennifer Humphries were critical to the success of the pre-, post-, and mid-conference field trips.

The period 2020-24 was exceptional in providing us with unanticipated events, notably the COVID-19 pandemic and the unfortunate circumstances arising from the war in Ukraine. I am grateful to Emma Stockton for her constant support as Executive Director of the IPA during this period, to the Chinese adhering body for its flexibility over the originally proposed ICOP, to the USPA for organizing the online RCOP in 2021 so professionally, and to Marc Oliva for the 2023 RCOP in Puigcerdá. The IPA depends on service from many people offering their time on a volunteer basis. So, in closing, it is a great privilege to recognize the particular commitment given to us all by Jerry Brown, Hans Hubberten, and Toni Lewkowicz, all of whom received the IPA Award for Lifetime Achievement in the last four years.

Christopher Burn

IPA Executive Committee, 2024-2028

Co-President
Isabelle Gärtner-Roer

Co-President
Gonçalo Vieira

Past President
Christopher Burn

Vice President
Lukas Arenson

Vice President
Fujun Niu

Committee Member
Edward Yarmak

Committee Member
Kjersti Gisnås

PYRN Representative
Joseph Young

Secretariat-Executive Director
Lin Chen

31st IPA Council Meeting

The 31st IPA Council Meeting convened on 16 and 18 June 2024, at Whitehorse. The President, Chris Burn, welcomed the IPA Council.

Frozen Ground

The President announced the release of the new volume of Frozen Ground with over 40 pages of updates on conferences, standing committees, action groups, projects, and affiliated organizations, the winners of the IPA's 3rd Photography Contest, and obituaries. *Stockton, E.J. and Burn, C.R. (eds.) 2024. Frozen Ground 47 (2023). International Permafrost Association (IPA). DOI: 10.52381/IPA.FG472023.1.*

Motions

Following an online ballot on Friday 24 May 2024, the Council unanimously approved in principle four motions for discussion at the 31st IPA Council Meeting.

- Amendments to constitution to allow co-presidency of the IPA.
- Amendments to constitution to establish a position on the Executive Committee for a PYRN representative.
- Amendments to constitution to establish the position of Past-President.
- Two IPA Lifetime Achievement Awards in 2024.

(The IPA Constitution amendments were approved via an online ballot in June 2025)

Election of the new Executive Committee members

Gärtner-Roer thanked the Nominations and Awards Committee for proposing two eligible persons for consideration by the Council. There are two positions to be vacated on the Executive Committee. The nominees are Kjersti Gisnås (Norway) and Lukas Arenson (Canada). Motion to close the nominations was proposed by Sharon Smith, seconded by Bernd Etzelmuller, and unanimously approved by the Council. Gisnås and Arenson were formally appointed to the Executive Committee and welcomed by the Council.

Isabelle Gärtner-Roer, Vice-President, introduced Joseph Young (Canada), the nominee for the PYRN representative. Motion to close the nominations was proposed by Antoni Lewkowicz, seconded by Rajmund Przyblyak, and unanimously approved by the Council. Gärtner-Roer welcomed Young to the Executive Committee.

Application for membership in the IPA

Ed Yarmak introduced the applications of Czech Republic and India for IPA membership. The president advised that the applications will be sent for online ballot later this year. Membership will begin in 2025.

Conferences

- ACOP2026: Ulaanbaatar, Mongolia

Yamkhin Jambaljav presented a proposal for the 3rd Asian Conference on Permafrost (ACOP2026) in Ulaanbaatar, Mongolia. The proposed theme is "Challenges posed by permafrost thaw to the global community". The conference will take place over five days and include pre- and post-conference field trips. Dr. Jambaljav proposed three dates: 22-26 June, 28 June to 2 July, and 10-13 July.

- ICOP2028: Florence, Italy

Mauro Guglielmin provided an update on the 13th International Conference on Permafrost (ICOP2028) to take place in Florence, Italy, from 25-30 June 2028. Prof. Guglielmin thanked the Council for approving the proposal which was prepared by Italy, Portugal, Spain, and Austria. The proposed theme is "Impacts of climate change on mountain and polar permafrost: risks, adaptation and mitigation". Prof. Guglielmin provided details on travel and accommodation in Florence for international participants. The organizers received support from several universities, institutions, and the city of Florence. The conference will be hosted at Firenze Fiera, Congress and Exhibition Center. The Palazzo dei Congressi can accommodate up to 1000 people. The keynote lecture will take place in Salone dei Cinquecento.

- EUCOP7: Wrocław, Poland

Matt Strzelecki presented a proposal for the 7th European Conference on Permafrost (EUCOP7) in Wrocław, Poland. The conference will be organized by Poland and Czech Republic and take place 17-22 June 2030. The local organizing committee plan to host about 600 participants. Field trips will visit the central lowlands, Sudetes Mountains at the Poland-Czech Republic border, and Tatra Mountains at the Poland-Slovakia border.

Reports from the Standing Committees

Isabelle Gärtner-Roer welcomed the Standing Committee representatives, whom have presented the following reports:

- Rock Glacier Inventory and Kinematics (RGIK), Cécile Pellet;
- Global Terrestrial Network for Permafrost (GTN-P), Saskia Eppinger;
- Permafrost Young Researchers Network (PYRN), Emma Lathrop and Natalie Arpin.

Reports from Action Groups

Ed Yarmak welcomed the Action Group representatives, whom have presented the following activity reports:

- Permafrost agroecosystems (2022-2023), Melissa Ward-Jones;
- RTS InTrain: Retrogressive thaw slump inventory and machine learning training-data development (2022-2023), Anna Liljedahl;
- The Himalayan PERmafrost Consortium (HiPERC) (2023-2024), Soumik Das and Elora Chakraborty;
- An Arctic-Boreal Carbon Flux data compilation and synthesis effort (ABCflux v2) (2023-2024), McKenzie Kuhn;
- PermHg: A global database of mercury concentrations in permafrost dominated regions (2024-2025), Kevin Schaefer;
- International Database of Geoelectrical Surveys on Permafrost (IDGSP): Phase 2 (2024-2025), Cécile Pellet and Teddi Herring.

Financial matters

The financial balance of the period 2020-2024 was presented and analyzed. The budget for 2025-2028 was discussed and approved, with specific funding allocated to early-career researchers to support participation in IPA conferences. Member dues will be maintained at least until 2026, pending a review proposal to be presented by the Executive Committee in 2025. The budget was approved.

The editorial efforts needed to organize the annual Frozen Ground Newsletter, their concentration in a short time and the long time span between editions were discussed by the Council. Following a suggestion by the Secretariat, with the aim of shaping the IPA's communication into one with steadier contact with members, it was decided that Frozen Ground should be prepared as a short monthly newsletter. The monthly newsletters will be compiled at the end of the year into a larger annual volume.

Participants of the 31st Council Meeting at ICOP2024 in Whitehorse, YT, Canada (Sunday 16 June 2023). Back (left to right): Joseph Young (Canada), Rajmund Przybylak (Poland), Antoni Lewkowicz (Canada), Michael Krautblatter (Germany), Julian Murton (UK), Mauro Guglielmin (Italy), Eva Stephani (USA), Annett Bartsch (Austria). Front (left to right): Emma Stockton (Canada), Christopher Burn (Canada), Isabelle Gärtner-Roer (Switzerland), Edward Yarmak (USA), Yamkhin Jambaljav (Mongolia), Gonçalo Vieira (Portugal), Tetsuo Sueyoshi (Japan), Sharon Smith (Canada), and Cécile Pellet (Switzerland).

The 12th International Conference on Permafrost (ICOP)

By Lukas Arenson (BGC Engineering, Canada)

The 12th International Conference on Permafrost took place in Whitehorse, Yukon, from June 16 to 21, 2025. Marking 26 years since Canada last hosted the 7th ICOP in Yellowknife, NT, this gathering represented a milestone for the Canadian permafrost community and was notably the first international event organized by the Canadian Permafrost Association.

Centred on the theme "Integrating Perspectives of Permafrost Thaw, Change, and Adaptation," the conference spotlighted the latest advances in the field and fostered engaging technical and scientific dialogue among academics, practitioners, contractors, suppliers, and students from around the world. The event drew a diverse group: 474 attendees on site and 130 virtually, representing 28 countries, with Canada (51%), the USA (20%), and Germany (7%) leading in participation. Students accounted for 30% of in-person participants, while early career researchers and professionals made up 40%, underscoring the conference's commitment to nurturing future leaders in permafrost studies.

Group photo of all participants along Yukon River with the conference venue behind

Held at the Kwanlin Dün Cultural Centre (KDCC) and Yukon University, the conference featured dynamic keynote addresses by Pascale Roy-Léveillée (Université Laval), Jocelyn Hayley (University of Calgary), as well as a fascinating presentation on Nun Cho Ga, the mummified woolly mammoth discovered in Yukon permafrost, by Debbie Nagano (Tr'ondëk Hwëch'in Government), Jeff Bond (Mammoth Terrain), and Grant Zazula (Yukon Government). The main program, running Monday through Wednesday, included over 200 oral presentations delivered across five parallel sessions and more than 200 posters showcased during three well-attended beer and poster sessions. On Thursday, participants explored local landscapes and first-hand permafrost challenges through a variety of field excursions, offering a refreshing change from the technical sessions.

In addition, two pre-conference and one post-conference multi-day field trips took attendees to sites such as the Klondike goldfields, the southern Dempster Highway, Ibex Valley, North Alaska Highway, and the Mackenzie Delta, offering immersive experiences in the northern environment and

Rob Kenyon (CGS President), Jocelyn Hayley (University of Calgary) and Lukas Arenson (Conference Chair).

Poster Session

insight into periglacial environments and engineering challenges. Recognizing the need to limit in-person numbers, the conference adopted a hybrid format: every technical session was live-streamed, and nearly 60 additional posters were made available online. Students were encouraged to create short video summaries—called frostbytes—which resulted in 43 innovative submissions worth viewing: link

A significant effort was dedicated to producing comprehensive conference publications, all accessible through the International Permafrost Association website (link). The conference received 64 full papers, 429 extended abstracts, and three detailed field guides for the multi-day trips, together forming a key legacy for ICOP2024 and honoring the tradition of previous conferences.

Throughout the event, a spirit of collaboration prevailed, reflecting a shared commitment to advancing permafrost science and engineering despite present-day challenges. Especially notable was the focus on the next generation and the thoughtful respect shown for both the land and its people. The success of the conference stands as a testament to the energy and dedication of the international permafrost community.

Heartfelt thanks go out to all sponsors, volunteers, and Gúnta Business, the conference managers, whose support was instrumental in making the event a resounding success.

Keynote presentation

Thursday Field Trip

ACTION GROUPS

IPA Action Groups are meant to fund targeted groups working on permafrost towards the production of well-defined products. Action Groups are funded on a competitive basis at up to €3000 per year (maximum of €6000 over two years). These groups have limited terms and focus on clearly defined research outputs, such as maps, scientific publications, or databases, that can be supported through the organization of workshops, management support, technical support, etc.

ACTION GROUPS (2023-2024)

The Himalayan PERmafrost Consortium (HiPERC)

By Soumik Das, Elora Chakraborty, Milap Sharma (Jawaharlal Nehru University, India), Pankaj Kumar (Inter University Accelerator Centre, India), Atul Kumar Singh (North Eastern Hill University, India) and Pavitra V Kumar (Inter University Accelerator Centre, India)

Over the past year, our research team has made significant strides in understanding permafrost dynamics in the Western Himalayan region of Lahaul and Spiti, India. Permafrost has traditionally played a significant role in sustaining freshwater resources in the climatologically semi-arid to arid landscape of Lahaul and Spiti. Our team has installed Miniature-Temperature Data Loggers (MTDLs) at selected sites in Lahaul and Spiti to monitor the thermal dynamics of the active layer (Frozen Ground 47, 2023). This continuous data collection is essential for assessing permafrost stability and seasonal thermal dynamics. Additionally, a comprehensive geomorphological mapping was conducted for the entire Lahaul region and selected micro-basins in Spiti at a detailed scale of approximately 1:2500, focusing on identifying and cataloging periglacial landforms. Absolute dating was used in a thermokarst formation, hummocky frost features, peat bogs and associated periglacial formations in Lahaul and Spiti to further our understanding regarding the chronology of the glacial-periglacial continuum and climatic amelioration since Local Last Glacial Maximum (LLGM). Our geochemical analyses of major oxides, rare earth and trace elements from collected sediment samples have offered valuable information on the geochemical processes, past moisture regimes and provenance in the permafrost regions.

Our outreach efforts included presenting a rock glacier inventory for the entire Spiti Basin at the “35th International Geographical Congress 2024” in Dublin, Ireland. This inventory is a significant step towards understanding the spatial distribution and characteristics of rock glaciers in the region. Our work has also contributed to notable publications, including studies on cryosphere–groundwater connectivity (van Tiel et al., 2024) and developments in permafrost science and engineering (Burn et al., 2025) in response to climate warming. These contributions underscore the importance of our research in the broader context of climate change and its impacts on permafrost regions in the Himalaya.

Looking ahead, we are in the process of taking the first annual readings from the installed MTDLs to assess temporal changes in ground temperatures. We are developing a permafrost distribution model for Lahaul and Spiti to predict permafrost extent and assessing its response to climatic variables. Efforts are underway to obtain absolute dating results of buried sediment structures, serving as proxies for permafrost melt events post-LLGM in Spiti. Additionally, we plan to utilize Ground Penetrating Radar (GPR) with sensor frequencies ranging from 80 MHz to 1500 MHz to map subsurface permafrost in selected sites across Lahaul and Spiti. Our collaborative network has grown to include 25 researchers from various disciplines and institutions across India, all dedicated to advancing the understanding of permafrost science and its implications in the context of climate change.

ABCflux v2: an Arctic-boreal carbon flux data compilation and synthesis effort

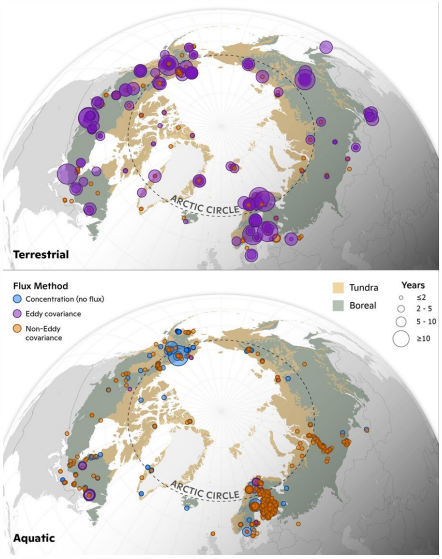
By Anna-Maria Virkkala (Woodwell Climate Research Centre, USA)

In 2024, the Arctic-Boreal Carbon Flux Data Compilation and Synthesis (ABCflux v2) team finalized a dataset of monthly CO_2 and CH_4 fluxes from terrestrial and aquatic ecosystems across the Arctic and boreal regions. This dataset integrates contributions from over 250 researchers alongside data from general repositories, flux networks, peer-reviewed literature and data from prior efforts. The resulting ABCFlux v2 has 23,656 flux site-months, 8,182 concentration site-months, and 199 seasonal observations from 1,024 sites. The dataset has been submitted to the ORNL DAAC for open access.

The team also completed a manuscript describing the dataset, entitled "ABCFlux v2: Arctic–boreal CO_2 and CH_4 monthly flux observations and ancillary information across terrestrial and freshwater ecosystems." The process involved extensive feedback from all 269 coauthors. The manuscript describes the dataset, summarizes the flux network, and synthesizes flux magnitudes across major ecosystem types. The effort was presented at EGU, AGU, and the Permafrost Carbon Network meetings. In parallel, the group prepared a near-final manuscript from a synthesis and upscaling workshop organized in 2023, entitled "Data-driven modeling of carbon fluxes across the Arctic–boreal region: recent achievements and future opportunities," which will be submitted later in 2025.

Looking ahead, starting in 2025, the team will focus on machine learning–based modeling of terrestrial and aquatic CO_2 and CH_4 fluxes to estimate Arctic–boreal carbon budgets. The group continues to track new flux data and foster collaboration among Arctic – boreal flux researchers.

Overall, the funding from IPA for the ABCflux effort has helped us build a strong flux community and the most comprehensive flux dataset from the Arctic–boreal region to date. The effort provides a foundation for understanding the magnitudes and drivers of permafrost-region carbon fluxes and for improving estimates of regional carbon budgets under changing climate and disturbance regimes.



Numbers of site-months for terrestrial CO2 and CH4 flux sites, and aquatic CO2 and CH4 flux sites included in ABCFlux v2. The number of months represented by circles refers to total, not necessarily consecutive months.

NEW ACTION GROUPS (2024-2025)

International Database of Geoelectrical Surveys on Permafrost (IDGSP): Phase 2

By Christian Hauck & Coline Mollaret (University of Fribourg, Switzerland)

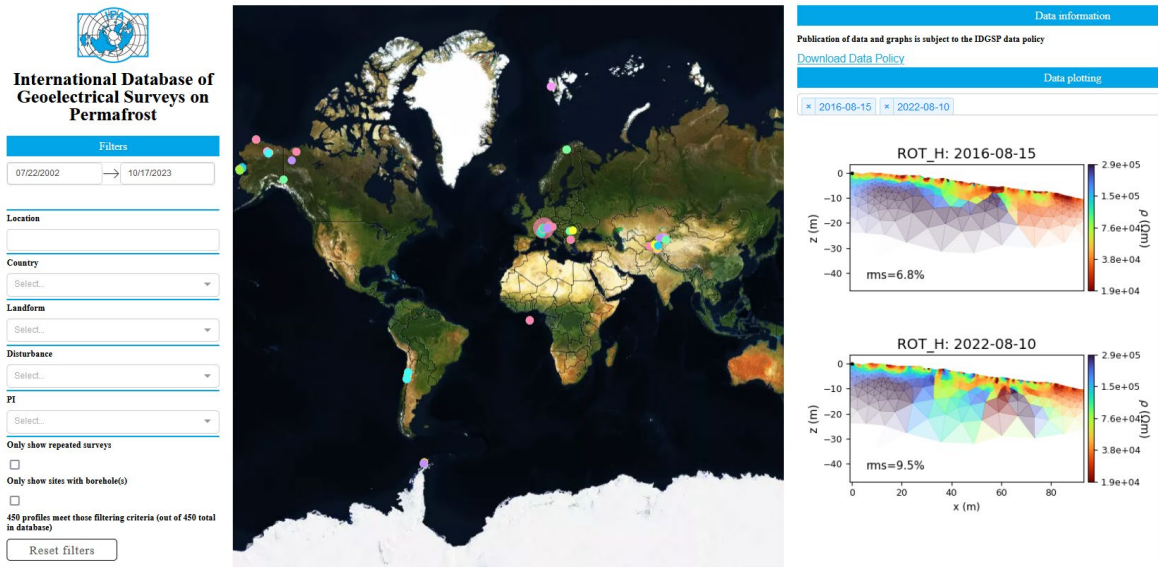
The IPA Action Group has the main objective of bringing together the international community interested in geoelectrical measurements on permafrost and laying the foundations for an operational International Database of Geoelectrical Surveys on Permafrost (IDGSP, link). Since 2021, we initiated a database for geoelectrical data on permafrost. Further, we develop guidelines for survey repetition and data processing. We promote and support the repetition of existing legacy geoelectrical measurements to yield the resistivity evolution over time and so detect temperature and ground

ice/water changes in response to climate changes.

The Action Group consists at present of a network of more than 100 scientists interested in permafrost geophysics from 18 countries. We also aim to increase the awareness of the value of geophysical data within the permafrost community.

Publication

Herring T., Lewkowicz A.G., Hauck C., Hilbich C., Mollaret C., Oldenborger G. A., Uhlemann S., Farzamian M., Calmels F., Scandroglio R. 2023. Best practices for using electrical resistivity tomography to investigate permafrost. Permafrost and Periglac Process. 34(4): 494-512. doi:10.1002/ppp.2207



Web interface of the database (link): the map shows the locations of more than 450 ERT profiles on permafrost which are currently contained in the IDGSP database, and repeated tomograms of an exemplary pro-file to the right

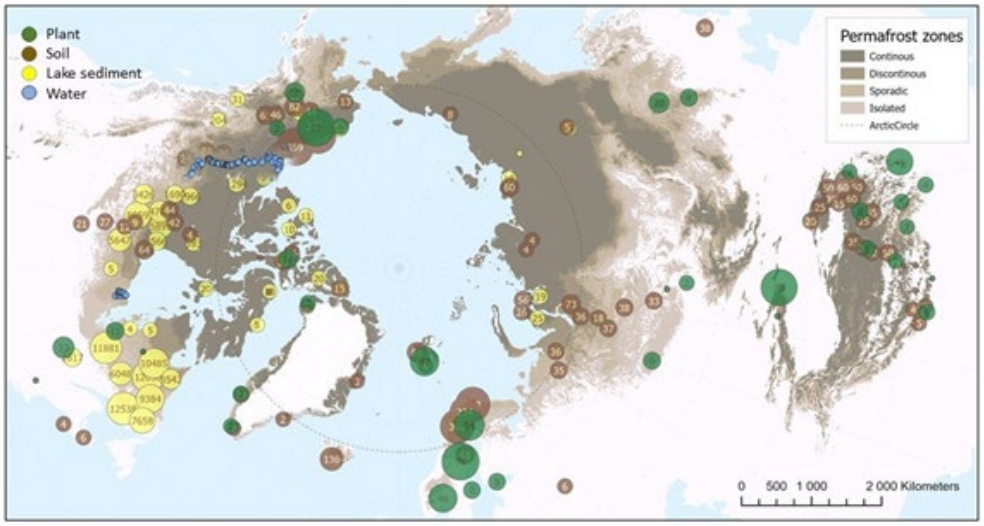
PermHg: A global database of mercury concentrations in permafrost and active layer soils

By Christine Olson (University of Colorado Boulder, USA)

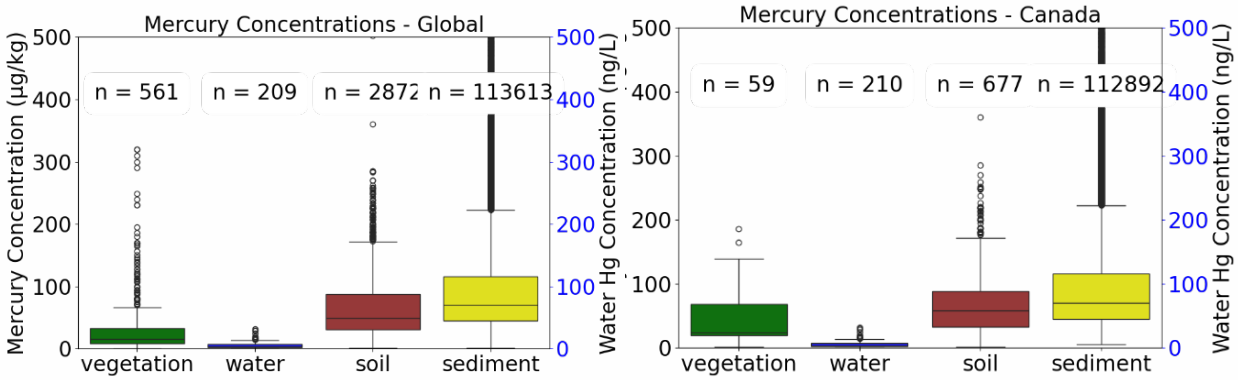
In December of 2024, several members of our Action Group attended the American Geophysical Union conference in Washington D.C. Christine Olson presented a poster titled “PermHg: A database of mercury concentrations in northern permafrost regions”. The poster presented our latest updates, including a map displaying nearly 150,000 measurements of mercury concentrations in permafrost soils, water, and vegetation worldwide.

We highlighted emerging trends from our data analysis, focusing on mercury correlations with metadata variables such as dissolved organic carbon, latitude, and soil/sediment depth. Mercury concentrations followed consistent global and regional patterns, with the highest concentrations observed in sediment, followed by soil, vegetation, and water. Our sample distribution is biased towards lake sediment samples and Canadian regions.

Looking ahead, our group plans to meet in April to advance our database manuscript and prepare the dataset for publication in the Northern Circumpolar Soil Carbon Database later this year. We look forward to continued collaboration as we refine the PermHg database to support research in Arctic mercury biogeochemistry and environmental change.



Global PermHg sample locations for plant, soil, and lake sediment mercury data. Circle size and numbers show sample density, while water samples are represented by uniform blue circles.



Boxplots of mercury concentrations across matrices. T-tests within each dataset (global and Canada) showed statistically significant differences among all matrices.

Standing Committees help the IPA achieve its mission and perform essential duties. Standing Committees provide long-term, essential contributions related to the IPA's objectives and report to the IPA Executive Committee, Council, and Secretariat.

Permafrost Young Researchers Network (PYRN)

By Natalie Arpin (Queen's University, Canada) & Joseph Young (Wilfrid Laurier University, Canada)

PYRN Seminar Series

PYRN has held a series of seminars on various aspects of permafrost science and engineering. We would like to thank the speakers who have generously given their time to take part in this series of talks and shared their wealth of knowledge with members of the network.

These speakers and topics have included:

- Permafrost Modelling and Technology with Dr. Stephan Gruber and Dr. Mehdi Pouragha (Carleton University)
- Permafrost and Linear Infrastructure with Dr. Shawn Kenny (Carleton University)
- Ground Ica in Canada: Field and Modelling Studies with Dr. Brendan O'Neill (Geological Survey of Canada)
- Planning and Challenges in Permafrost Fieldwork with Dr. Steve Kokelj (Northwest Territories Geological Survey)

Recordings of the seminars are available on the PYRN YouTube channel (link).

To learn more about upcoming seminars, follow PYRN on social media or join our email list, https://pyrn.arcticportal.org/. If you would be interested in presenting to the network, please contact us at contact@pyrn.org.

PYRN Early Career Workshop at the 15th DACH Permafrost Conference

The PYRN branch of Germany (D), Austria (A) and Switzerland (CH) was thrilled to welcome over 35 participants for a PYRN workshop at 15th DACH Permafrost Conference in Davos, Switzerland.

The workshop was very interactive, and we want to thank again all speakers: Fabian Felder and Moushumi Ulrich-Nath from Lib4RI, Ranita Pal, Enrico Peruselli and Ionut Iosifescu Enescu from the Swiss Federal Institute for Forest, Snow and Landscape Research WSL, EnviDat and Christoph Suter with his team from WSL Institute for Snow and Avalanche Research. Additionally, we would like to thank Samuel Weber (SLF) as representative for the conference organizing team for their great work. Giulia Bertolotti (Austria), Julie Wee (Switzerland) and Saskia Eppinger (Germany) currently represent the PYRN DACH branch. To contact us or to become a part of the regional mailing list, just write to pyrn.dach@gmail.com.

Upcoming Events

Stay in the loop on upcoming events from PYRN by following us on social media (@pyrn-official.bsky.social on Bluesky and @PYRN_offical on Instagram and X) and by becoming a PYRN member at: https://pyrn.arcticportal.org/.

Participants of the PYRN workshop at the 15th DACH permafrost conference (Photo Credit: Marcia Phillipps)

STANDING COMMITTEES

The Global Terrestrial Network for Permafrost (GTN-P)

By Dmitry Streletskiy (George Washington University, USA) & Anna Irrgang (Alfred Wegener Institute, Germany)

The GTN-P Steering Committee welcomes Lukas Arenson from BGC Engineering as the new IPA ex-officio representative, succeeding Gonçalo Vieira. Gonçalo has been an integral part of the GTN-P Steering Committee since 2012—first as a full member representing the Antarctic community until 2022, and subsequently as the IPA ex-officio representative. We extend our sincere gratitude to Gonçalo for his many years of dedicated service and valuable contributions.

GTN-P maintained a strong presence at major permafrost conferences and events throughout the year. At ICOP in Whitehorse (June 2024), GTN-P hosted a well-attended session titled Permafrost temperature, active layer thickness, and rock glacier velocity, drawing both in-person and online participants.

The GTN-P virtual General Assembly took place on November 21, 2024, offering a platform for updates on permafrost monitoring and research. National and young national correspondents from 16 countries shared their insights and developments. Looking ahead, the next GTN-P General Assembly is scheduled for November 14, 2025. In December, GTN-P concluded the year by presenting a poster at the AGU Fall Meeting, highlighting the latest progress in data platform development. GTN-P has also submitted a session proposal for the 3rd Asian Conference on Permafrost (ACOP), which will be held in Ulaanbaatar from June 28 to July 2, 2026.

The GTN-P database continues to be a key resource for the global scientific community. A new version of the GTN-P database, currently under development in close collaboration with the permafrost community, is expected to go live by late 2025.

GTN-P members contributed to recent chapters of the State of the Climate report, with a focus on global and Arctic climate. They are now working on manuscripts addressing global permafrost and active layer thickness (ALT) trends, anticipated to be finalized in 2025. In addition, GTN-P has applied for GCOS accreditation, with results expected in 2025. We are currently seeking a new ex-officio representative to serve in the Terrestrial Observation Panel for Climate (TOPC). If you are interested, please contact us at gtnp-office@awi.de.

Experts from GTN-P also collaborated with GCOS and GCW to contribute to the WMO Guide on Instruments and Methods of Observation. The WMO Commission for Observation, Infrastructure and Information Systems (INFCOM-3) recently approved Chapter 4: Measurement of Permafrost, now included in Volume II: Measurement of Cryosphere Variables of the WMO Guide (WMO-No. 8, 2025). The document is available via DOI: https://doi.org/10.59327/WMO/CIMO/2

Rock Glacier Inventories and Kinematics (RGIK)

By Cécile Pellet (University of Fribourg, Switzerland) & Line Rouyet (NORCE, Norway)

The mission of RGIK is to coordinate the global compilation and distribution of standardised rock glacier products, as well as to foster international collaboration and the advancement of the understanding of rock glaciers.

Launched in 2018 as an IPA Action Group, RGIK built a network of around 260 members across 29 countries, producing reference material and training tools to support the development of comparable rock glacier data. In 2023, RGIK transitioned from an Action Group into a permanent structure.

RGIK had its first General Assembly (GA) meeting on May 29th, 2024 (25 participants). The members approved the Bylaws and elected the Executive Committee (ExCom) on June 7th, 2024 (54 votes). The RGIK Standing Committee was approved by the IPA Council on June 16th, 2024. The second GA meeting took place on May 26th, 2025 (29 participants).

In 2024-2025, RGIK worked on four topics, which will remain our priorities in 2025-2026:

- **Launch and development of working groups:**
  - **Rock Glacier Inventory (RoGI).** Enhancing tools and guidelines for global RoGI production. The group was reactivated in 2025 with new contributors. Testing the RoGI tools and expanding the guidelines are ongoing.
  - **Rock Glacier Velocity (RGV).** Developing best practices for processing RGV as a quantity of the ECV Permafrost. A workshop was organised in November 2024 and compiling technical recommendations is ongoing.
  - **Machine Learning (ML).** Sharing expertise and setting best practices for ML applications in rock glacier inventorying. A call for involvement was issued.
  - **Equity, Diversity, and Inclusion (EDI).** Promoting inclusive participation and representation within the community. A call for involvement was issued.
  - **Data Management (DM).** Defining and implementing data management standards. A workshop with GNT-P at EGU25 supported this effort and database development is underway.
- **Communication material and tools:** A logo and associated communication material were made to promote the Standing Committee. A new version of our website was launched at https://www.rgik.org/. We developed new tools to enhance resource and information sharing, including a YouTube channel, a member directory and forum. Such functionalities will keep improving in the future.
- **Seminars and events:** We organized eight webinars with scientific presentations, each attended by 15 to 30 participants. Rock glacier sessions, side-meetings and social events were organized at ICOP2024 and EGU2025. Similar activities are planned in 2025-2026, at IAG conferences in Romania (2025) and New Zealand (2026), EGU (2026) and ACOP in Mongolia (2026). A RoGI training school and a RGV workshop are also planned.
- **Reference documents:** RGIK contributed to recent publications:
  - Annual release of the RGV section in the BAMS State of Climate.

- RGV guidelines in the WMO guide to Instruments and Methods of Observation.
- Review paper on RGV in the Reviews of Geophysics.
- Data release and description of 12 RoGI in Zenodo and ESSD.

A more comprehensive list of references is available on our website and will keep being updated in the future.

Interested to join RGIK? Become a member on https://www.rgik.org or email info@rgik.org for more information!

RGIK ExCom members in 2024-2025

STANDING COMMITTEES

International Advisory Committee (IAC)

By Antoni Lewkowicz (IAC Chair, University of Ottawa, Canada)

The International Advisory Committee (IAC) has been re-constituted for the period 2024-2028. The members are Antoni Lewkowicz (Chair - Canada), Anne Morgenstern (Germany), Marc Oliva (Spain) and Lukas Arenson (IPA Executive Committee). The main task for the IAC is to provide counsel, as needed, to the organizers of the next Regional Conference on Permafrost (RCOP) and the subsequent International Conference on Permafrost (ICOP). The creation of an international committee with this specific mandate reflects the importance of these conferences to the IPA and the international permafrost community in general. They represent critical opportunities to share scientific and engineering advances, to foster new opportunities for collaboration through personal contacts and to support young researchers, the future of the field. The current IAC members, all of whom have been heavily involved in organizing such conferences in the past, look forward to providing advice to the organizing committees for the 3rd Asian Conference on Permafrost in Ulaanbaatar, Mongolia in June 2026 and the 13th ICOP in Florence, Italy in June 2028.

Glacier and Permafrost Hazards in Mountains (GAPHAZ)

By Holger Frey (University of Zurich, Switzerland)

In 2024 GAPHAZ continued to play an active role in promoting the exchange of information and experience on glacier and permafrost hazards in mountains within the international scientific community and between the scientific and governmental communities. In addition to presentations and contributions by GAPHAZ board members to workshops and meetings, organizing and sponsoring conference sessions remained a cornerstone of GAPHAZ activities. Mainly at the EGU General Assembly, but also other conferences of the geoscientific community, a number of sessions, dedicated to focus topics of GAPHAZ, were held, with members of the GAPHAZ community both convening and contributing to such sessions.

In September, the Italian version of the GAPHAZ guidelines on the Assessment of Glacier and Permafrost Hazards in Mountain Regions has been published. This effort was coordinated by CNR-IRPI, the Research Institute for Hydrogeological Protection of the National Research Council, with the support of the Italian National Civil Protection Department (DPC). Marta Chiarle, a former chair of GAPHAZ, was instrumental in this effort, which is another important step towards making these guidelines accessible to non-English speaking representatives of agencies, authorities and practitioners in charge of the assessment and management of glacier and permafrost related hazards. This Italian version is complemented by a Spanish and a Russian translation of the original English guidance document.

A paper on the analysis of the outburst of South Lhonak Lake in Sikkim, India, in October 2023, was published earlier this year in Science. Although not directly a GAPHAZ publication, this reflects a large community effort, involving many members of the GAPHAZ community

At the end of 2024, Michele Koppes stepped down as chair, after serving in the GAPHAZ management board for six years. Her role has been taken over by Holger Frey, while Pratima Pandey now serves as vice chair. Mylène Jacquemart from ETH Zurich joined the board as the new secretary. The GAPHAZ community currently counts 198 members that are registered on the mailing list. GAPHAZ has an open structure and inclusive orientation, everyone interested in the topics of glacier and permafrost related hazards in mountains can sign up to the GAPHAZ mailing list by sending an email to listserv@lists.ubc.ca with the text "subscribe GAPHAZ-members" in the body (no other text, such as signatures etc.).

Since February, the GAPHAZ website is not operational anymore, as the CMS of the webpage was outdated. A new website is currently under construction and will go online soon. During EGU 2025, where again many sessions related to GAPHAZ topics were held, a GAPHAZ account on bluesky was launched (@gaphaz.bsky.social). The aim of this account is to provide the GAPHAZ community and other interested persons with updates and relevant information, without overloading the established, low traffic mailing list.

Further key activities of 2025 will include a session at the IAMAS-IACS-IAPSO Joint Assembly (BACO-25), to be held in Busan, South Korea, from 20-25 July, and a session at the International Mountain Conference (IMC2025), taking place in Innsbruck, Austria, from 14-18 September, where GAPHAZ already hosted a session at the last edition in 2022.

International Association of Geomorphologists (IAG)

By Achim A. Beylich (IAG Secretary-General), Efthimios Karymbalis & Anita Bernatek-Jakiel (IAG Training Officers)

Since 2016, an Early Career Researcher Conference Travel Grants agreement between the International Permafrost Association (IPA) and the International Association of Geomorphologists (IAG), linked to the objectives of the existing Memorandum of Understanding (MoU) between the two associations, has further enhanced the cooperation between IPA and the IAG. Both associations aim to encourage the participation of early career researchers in their international conferences and recognize the need to provide travel support for this purpose. Grants are used to support the active participation of early career researchers whose interests intersect with those of the two associations, generally in the area of permafrost and periglacial research. The grants comprise direct financial support for travel and accommodation and free conference participation.

All on-site attendees listening to a presentation by Lukas Arenson, conference chair of the 12th ICOP, presenting in the Kwanlin Dün Cultural centre, Whitehorse / Canada. Photo by Melanie Stammler.

As part of its training programme, the IAG offered travel grants to support the participation of two young geomorphologists in the 12th International Conference on Permafrost (ICOP 2024), held in the city of Whitehorse, Yukon, Canada, from 16 to 20 June 2024. Both grant holders expressed their gratitude for the financial support provided by the IAG, which made their participation in ICOP 2024 possible. One of the Grant Holders, Roger Creel from the Woods Hole Oceanographic Institution, USA, had the opportunity to serve as an invited speaker in a session on coastal permafrost. He also took part in a conference field trip, during which geophysical measurements were conducted on a permafrost thaw slump – an in-person experience that according to him has "no substitute". The second grant holder, Melanie Stammler from Bonn University, Germany, had her work published as a full conference paper. She emphasized that the event offered her "invaluable" feedback on her research, along with the opportunity to "explore new approaches, transfer knowledge, reconnect with colleagues and exchange ideas".

The 11th IAG International Conference on Geomorphology is taking place in Christchurch, New Zealand from 2-6th February 2026. Covering all aspects of geomorphology, the conference has received 1140 abstracts from 956 submitters across 58 countries. More information about the conference including plenary speakers, fieldtrips, workshops, conference sessions, and registration details can be found on the conference website: icg2026.co.nz.

US Permafrost Association (USPA)

By Ming Xiao (Pennsylvania State University, USA)

In 2024, the US Permafrost Association (USPA) continued to advance permafrost science and engineering, grow and serve the membership, provide permafrost education, serve cold regions engineers and scientists, and strengthen international collaborations. The USPA organized 8 webinars (from October 2023 to November 2024) with 666 participants and 72 Professional Development Hour certificates issued. The USPA awarded 13 grants for a total of $10,500 to support students and early-career members. The USPA-PYRN Education Fund (UPEF) awarded seven grants to early-career members of the USPA totaling $5,000. These funds helped early-career members to attend the International Conference on Permafrost (ICOP) (Whitehorse, Canada), the 2024 American Geophysical Union (AGU) conference (Washington, DC), and the 2025 Toolik Steering Committee meeting (Santa Barbara, California). UPEF also coordinated the Andrew Slater Memorial Award and the Erv Long Memorial Award. Furthermore, UPEF is in the process of establishing the Ronnie Daanen Scholarship to support students conducting permafrost hydrology research.

The USPA Annual Members Meeting occurred on December 9 2024 during AGU's Annual Fall Meeting in Washington, D.C. Over 70 USPA members and friends attended the fun annual gathering. Dr. Jerry Brown was awarded the *USPA Lifetime Achievement Award* at the meeting to honor his many scientific accomplishments and his service to the global permafrost community for over 60 years.

Dr. Jerry Brown receiving the USPA Lifetime Achievement Award, December 2024

In 2024, the USPA Community Care Committee continued to host training and mentorship events through the Field Safety Workshop held in March and the mentorship lunch during the AGU meeting. USPA Secretary Katherine Schexneider began publishing the bimonthly Thawing Ground Newsletters. USPA's members attended the 12th International Conference on Permafrost (ICOP) and its representatives attended the International Permafrost Association (IPA) meeting at ICOP.

Some members of the USPA Community Care Committee at ICOP in Whitehorse in June 2024.

The USPA Family Care Program (FCP) was created in early 2024 and officially launched in April 2024. The purpose of the FCP is to support and recognize the additional financial and logistical burdens placed upon families within the permafrost community. The USPA believe that caregivers should not have to constantly make the hard choice between personal obligations and career success. This novel and newly launched program aim to support researchers in diverse familial situations providing caregiver grants for all types of human care for permafrost families. The USPA FCP awarded its first two caregiver awards that supported childcare while conducting fieldwork.

USPA Family Care Program logo (left) and a thank you photo for an awarded Caregiver Award (right).

ASSOCIATED ORGANIZATIONS

Canadian Permafrost Association (CPA)

By Guy Dore (Laval University, Canada) & Ria Nicholson (CPA Executive Assistant)

The past year has been busy for the Canadian Permafrost Association (CPA). Following last year's successful International Conference on Permafrost, the CPA is now preparing for the Canadian Permafrost Conference, which will be held in Winnipeg from September 21-24, 2025, in conjunction with GeoManitoba.

The CPA is also developing its 2026-2030 strategic plan. This plan will build on past achievements and set the course for future initiatives. Numerous action groups have been created to support this work, a few of which will be discussed here.

The Thermal Modelling Action Group (TMAG) is composed of researchers, specialists, and industry professionals. TMAG aims to develop a best practice document on thermal modelling for students, early-career researchers, and those with limited exposure to thermal modelling. Several chapters have been completed, and the document is envisioned to be completed and publicly circulated at the 2025 CPA Annual General Meeting.

The Permafrost Education Action Group (PEAG) was launched with the primary goal of developing a permanent permafrost training program to support the scientific and engineering needs of the Canadian Permafrost Association (CPA) members and partner organizations working in permafrost regions. The PEAG aims to establish a comprehensive training program that will support capacity building and knowledge exchange across the Canadian permafrost community and beyond.

The Tundra Trails Action Group (TTAG) aims to prepare plain-language guidelines for planning, design, construction, monitoring, and maintenance of trails in tundra environments underlain by permafrost, in a manner that limits permafrost degradation and accommodates landscape responses to climate change. Since its inception in early 2025, TTAG has met on several occasions to discuss key challenges associated with tundra trails and gather information (e.g., site photographs,

Photo from the Tundra Trails Action Group on Angus Lake Trail, featuring northern community member Manny Kudluk.

associated anecdotes, reports/publications) to support the development of associated guidelines.

A framework for the guideline document has been drafted, and the TTAG looks forward to the collaborative preparation of each section. Finally, the Permafrost Terminology Action Group (PTAG) has been working for more than four years to revise the entries, definitions, comments and references in the IPA's 2005 version of the *Multi-Language Glossary of Permafrost and Related Ground-Ice Terms. The new compilation will soon be published by the CPA as the Glossary of Permafrost Science and Engineering*. 261 of the 398 entries in the IPA's 2005 Glossary were modified to some degree. The 2025 edition will include 64 new entries (e.g., air-cooled embankment, megaslump, permafrost carbon, space frame foundation), reflecting advances in knowledge within the field over the past two decades. The audiences for the technical material in the Glossary of Permafrost Science and Engineering include researchers, practitioners and post-secondary students. An Illustrated Permafrost Dictionary (link), which covers 100 of the most important terms, is primarily designed for non-experts. It was completed by PTAG and published by the CPA in 2024, debuting at ICOP2024. The new Glossary will be released at the GeoManitoba 2025 conference in Winnipeg in September 2025 and will also become available for download from the CPA website.

Advancing Permafrost Research and Resilience: A Collaborative Effort by CPA partners

Significant progress in permafrost research and northern infrastructure resilience was made in 2024, including key contributions from Yukon University (YukonU), Géocryolab, and the Yukon Geological Survey (YGS). These efforts highlight a collaborative approach to understanding, monitoring, and adapting to the impacts of a changing climate on permafrost landscapes.

The **Permafrost and Geosciences Research (PGR)** team at YukonU, led by Fabrice Calmels, conducted applied research along the Yukon's three main highways (Alaska, Klondike, and Dempster) in support of the territorial Department of Highways and Public Works. Methods used included geotechnics, telemetry, geophysics, drone-based LiDAR, and thermography imaging. Thermal imagery served to detect warmer near-surface water flow related to permafrost degradation and/or the colder influence of massive near-surface ice masses, which are responsible for infrastructure failure when melting. Complementing thermal imagery with LiDAR-based elevation models enabled an assessment of the relationship between ground surface temperature and topography which led to a better understanding of processes that lead to infrastructure failure. PGR modernized its ground temperature monitoring network and expanded into implementing new geohazard systems which allow for real-time monitoring of critical transportation infrastructure sites impacted by permafrost-thaw related hazards. PGR also completed a CCPN-funded project in partnership with the Champagne and Aishihik First Nations, establishing a vital knowledge base for community-led permafrost monitoring.

Géocryolab, led by Daniel Fortier, continues to advance permafrost research through a wide range of collaborative projects. Fortier and Vincent Langlois (U. Lyon, France) have used temperature-controlled chambers to better understand active layer detachment slides triggered by rain, the initiation of thermal erosion on slopes, and the formation of sinkholes due to subsurface water flow. In collaboration with Pooneh Maghoul (Polytechnique) and Aylin Nouri, Géocryolab is developing an innovative method to thaw permafrost, drain thawed soils, and consolidate them for pre-thawing construction sites and the installation of heat-dissipating buildings on ice-rich permafrost. Alongside Marc Amyot (UdeM), Fortier and Géocryolab are evaluating the thermal impact of flooded zones and subsequent methylmercury emissions from the first North-American run-of-the-river power plant built on permafrost at Inukjuak, Nunavik. Fortier and Emmanuèle Gautier-Costard's team (U. Sorbonne France) are studying the impact of river dynamics (Beaver Creek, Yukon) on permafrost thermal regimes since the Late Holocene. Fortier and Antoine Séjourné's team (U. Paris-Saclay, France) are investigating the impact of thermokarst lakes on talik development in permafrost and

GHG emissions in southwestern Yukon.

The **Yukon Geological Survey (YGS)** continued its crucial work in mapping and monitoring permafrost hazards. It also discovered some of the southernmost documented pingos in the Haines Junction area. The YGS is now compiling a comprehensive database of permafrost features and hazards along the Yukon Highway network and establishing a network of long-term deep permafrost monitoring stations in Yukon communities.

Yukon Geological Survey student, Heather Clarke, working on a retrogressive thaw slump on the Dempster Highway. Photo by Derek Cronmiller.

The broader international permafrost community saw significant developments, with Chris Burn concluding his term as President of the International Permafrost Association (IPA) at ICOP2024. These collaborative efforts from local research, governmental surveys, and international leadership underscore a robust approach to addressing the complex challenges presented by permafrost in a changing world.

ICOP Beaufort Delta Field Trip：

The Beaufort Delta field trip, held 22-27 June 2024 based out of Inuvik, NWT after the 12th ICOP, was an initiative of the Canadian Permafrost Association, Government of Northwest Territories (GNWT) – Northwest Territories Geological Survey (NTGS), Aurora Research Institute (ARI) – Aurora College, and Carleton University. This field trip took 13 international participants throughout the Beaufort Delta Region by boat, road, and air. Trip themes included permafrost characteristics and the expression of permafrost land systems across a diverse region, permafrost interactions with community and transportation infrastructure, and the consequences of thaw in a changing climate.

Photo by Marek Kasprzak shows participants spelling 'PINGO'.

Key locations visited included thaw slumps of the Peel Plateau, the Richardson Mountains, dynamic river and stream highway crossings, active field monitoring and snow manipulation experiments, aggregate borrow pits undergoing post-development thermal evolution, the Pingo Canadian Landmark, and Reindeer Station on the East Channel of the Mackenzie Delta. The trip was led by Steve Kokelj, Jennifer Humphries, Alice Wilson, and Chris Burn, and integrated current research by a range of collaborators.

2025 Inuvialuit Permafrost Workshop： In February 2025, the Inuvialuit Land Administration (ILA) held a 4-day Permafrost Workshop in Inuvik, NWT. The workshop was organized by Hans Lennie of the ILA, and supported by Jennifer Humphries of Aurora Research Institute, Chris Burn of Carleton University, and Steve Kokelj, Tim Ensom, and Alice Wilson from the NWT Geological Survey (GNWT). The main purpose of the workshop was to understand the views and perspectives of those interested in permafrost throughout the Inuvialuit Settlement Region (ISR) so that permafrost research and monitoring will better serve the Inuvialuit. There is much visible change in the permafrost environment of the ISR, especially through coastal erosion and the development of thaw slumps. The threats to coastal communities' infrastructure, the condition of the landscape, and the quality of freshwater are key concerns. The condition of the many drilling waste sumps is a long-standing issue.

"The Gunghi Creek crossing on the Inuvik-Tuktoyaktuk Highway". This photo is associated with the 2025 Inuvialuit Permafrost Workshop story.

The workshop was attended in person by about 70 people, including representatives of Inuvialuit boards and committees. One key outcome was that "we don't want to forget what we already know." Another key conclusion was that long-term working relationships with Inuvialuit have been essential to understanding regional permafrost change, and there is an

important opportunity for expanded investment in the wide range of available Inuvialuit support. A related outcome was that a wholistic approach to the permafrost environment is needed to address the priorities of land users, which may not be those of individual scientists. The workshop was sponsored by Polar Knowledge Canada, the ILA, Natural Resources Canada, GNWT, Aurora College, and PermafrostNet.

ASSOCIATED ORGANIZATIONS

State Key Laboratory of Cryospheric Science and Frozen Soil Engineering, NIEER, CAS

By Mingyi Zhang (Vice-Chair of NIEER and Director of SKL-CSFSE, China) & Lin Chen (Vice-Director of SKL-CSFSE, China)

State Key Laboratory of Cryospheric Science and Frozen Soil Engineering (SKL-CSFSE), Northwest Institute of Eco-Environment and Resources (NIEER), Chinese Academy of Sciences (CAS) was established in December 2024 through the merger of two former Laboratories, namely State Key Laboratory of Frozen Soil Engineering (founded in 1989) and State Key Laboratory of Cryospheric Sciences (founded in 2007). The SKL-CSFSE focuses on key research areas, including sustainable cryosphere development, permafrost engineering, permafrost hazards, cold-region environments, polar environments, and Arctic shipping routes. In addition, it operates 18 observation stations, including four National Observation and Research Stations:

- Tianshan Glaciological Station (established in 1959)
- Cryosphere Research Station on the Qinghai-Tibet Plateau (established in 1987)
- Qinghai-Beiluhe Plateau Frozen Soil Engineering Safety Station (established in 2002)
- Yulong Snow Mountain Cryosphere and Sustainable Development (established in 2006)

Distribution of the observation stations of the SKL-CSFSE

4th Chinese Conference on Frozen Soil Engineering and Cold Region Environments was held in Lanzhou from May 10 to 12, 2024, under the theme "Building a Beautiful Silk Road, Contributing Permafrost Wisdom, Advancing Engineering Strategies", jointly hosted by the China Society of Cryospheric Science and the State Key Laboratory of Cryospheric Science and Frozen Soil Engineering, NIEER, CAS. The conference brought together over 700 participants from 126 affiliations across China, including scientists, engineers, postdoctoral researchers, and graduate students. Throughout the three-day event, attendees actively presented their research findings and engaged in in-depth academic discussions, highlighting their strong professional expertise and collaborative spirit.

4th Chinese Conference on Frozen Soil Engineering and Cold Region Environments in Lanzhou

International Research Center for China-Mongolia-Russia Cold and Arid Regions Environment and Engineering (IRC-CMR-CAREE)

In China, Mongolia, and Russia, permafrost covers large areas, especially in their adjacent regions such as Northeast China, Siberia in Russia, and the Mongolian Plateau. However, it has quickly degraded under climate warming and human activities, which triggered a series of environmental and engineering issues, such as desertification, water resource scarcity and infrastructure instability. Therefore, the joint scientific research between China, Mongolia and Russia is urgent in permafrost degradation and its environmental and engineering impacts, and techniques preventing permafrost thawing under infrastructures.

The opening ceremony of Chinese branch center in Lanzhou, China

The opening ceremony of Russian branch center in Yakutsk, Russia

Based on this research need, the International Research Center for China-Mongolia-Russia Cold and Arid Regions Environment and Engineering (IRC-CMR-CAREE) has been jointly established by three institutions, namely the Northwest Institute of Eco-Environment and Resources (NIEER), Chinese Academy of Sciences (CAS), the Institute of Geography and Geoecology (IGG), Mongolian Academy of Sciences (MAS) and the Melnikov Permafrost Institute (MPI), Russian Academy of Sciences (RAS).

The opening ceremony of Mongolian branch center in Ulaanbaatar, Mongolia

The opening ceremonies of their branch centers were held in Lanzhou, China on 18 May 2024, in Yakutsk, Russia on 25 September 2024, and in Ulaanbaatar, Mongolia on 19 June 2025, respectively. To date, based on IRC-CMR-CAREE, over 10 international cooperation projects have been approved, more than 30 joint monitoring sites in three countries have been established and a series of academic and researcher exchanges have been organized.

International Centre for Integrated Mountain Development (ICIMOD)

By Sonam Wangchuk (ICIMOD, Nepal)

Mountain permafrost remains one of the least understood components of the cryosphere in the Hindu Kush Himalaya (HKH), despite its likely influence on carbon storage, biodiversity, high-altitude landslides, debris flows, slope stability, sediment release, and the livelihoods of mountain communities.

ICIMOD's work on mountain permafrost began in 2014 in Nepal, with ongoing efforts to expand the work to the regional member countries. Currently, ICIMOD operates three active monitoring sites in the Nepal Himalayas: Langtang, Humla, and Rikha Samba. At these sites, we collect near-surface ground temperature (NSGT) data, which is essential for understanding permafrost distribution, thermal dynamics, and seasonal freeze-thaw cycles. This data also serves as a foundation for integrating remote sensing and numerical modeling approaches to map and predict permafrost presence and evolution.

Over the past decade, our experience in collecting and analyzing NSGT data in the Nepal Himalayas has highlighted the need for a standardized approach to collected NSGT data ensure consistency and compatibility across diverse terrains and monitoring sites. Recognizing this, ICIMOD developed a comprehensive manual in 2024 for standardized NSGT data collection, making it easier to integrate datasets from multiple regions and facilitate collaboration among regional member countries. In the same year, ICIMOD experts relocated sensors in the Langtang and Humla sites, following this standardized approach, ensuring consistency in data quality and comparability.

In November 2024, ICIMOD, in partnership with the National Center for Hydrology and Meteorology (NCHM), Bhutan, extended its permafrost monitoring network to the Bhutan Himalayas.

The team is navigating treacherous terrain in search of a suitable area to install near-surface ground temperature sensors in Shodug Valley, Bhutan.

Together, they installed 19 NSGT sensors in the Shodug Valley, located in the headwaters of Thimphu, where permafrost is likely to be present. This installation follows the same standardized approach, ensuring the data can be seamlessly integrated into broader regional analyses. Once the presence of permafrost is confirmed in these sites, the team plans to quantify additional parameters, such as active layer thickness, using geophysical techniques.

ICIMOD is equally committed to capacity building and knowledge sharing. During field expeditions, ICIMOD actively involves representatives from regional member countries, universities, government agencies, and partner institutions, ensuring a diverse and skilled workforce capable of advancing permafrost science in the region. These efforts aim to foster a robust regional scientific community equipped to tackle the unique challenges of permafrost research in the high mountain environment of the HKH.

The team is collecting attributes of a near-surface ground temperature sensor after deploying it at a depth of 15-20 cm in the ground, Shodug Valley, Bhutan.

ASSOCIATED ORGANIZATIONS

Aurora Research Institute, Aurora College (ARI)

By Jennifer Humphries (Aurora Research Institute, Canada)

Internationally, the Aurora Research Institute (ARI) is recognized for its work in advancing the research capacity of the Northwest Territories, Canada, by offering specialized field support, laboratory space, and accommodations, among other services. In addition to logistical and field support, we also have a dedicated team that leads a range of research programs related to permafrost, water quality, and GIS, as well as an award-winning science, technology, engineering, and mathematics (STEM) Outreach Program. Some big news for 2024 is that the ARIs STEM Outreach Program received national recognition – winning the NSERC Award for Science Promotion - for their work providing high-quality education initiatives that are hands-on and meaningful to northerners. The Outreach team offers a variety of support for STEM education across Canada's Northwest Territories, including community events, gear loans, classroom visits, and after-school programming.

The 2024 wildfire season was also highly active, following an extreme and disruptive fire season in 2023. ARI continued to provide logistical assistance, laboratory support, equipment and field assistance to a variety of partners, including national and international academic institutions, Parks Canada, the Geological Survey of Canada, the Government of Northwest Territories, the Department of Fisheries and Oceans, and many others. Some of the ongoing initiatives we are involved in include monthly thaw depth, snow depth, and vegetation data to the Terrestrial Multidisciplinary Distributed Observatories for the Study of Arctic Connections (T-MOSAIC), maintaining two long-term permafrost monitoring sites near Inuvik, NT, in collaboration with Carleton University, and mapping for the NWT Thermokarst Mapping Collective.

In Inuvik, the permafrost research group is working to better understand how permafrost affects the performance of transportation infrastructure in the NWT, as well as the connections between permafrost degradation and water quality. Another key aspect of our permafrost program is our collaboration alongside GNWT departments in managing the ground temperature monitoring network in the Beaufort Delta Region. Other research projects focus on several key areas: (a) studying the thermal evolution of the Inuvik-Tuktoyaktuk Highway embankment after construction, (b) analyzing water geochemistry to assess the impacts of permafrost degradation on the hydrology of Arctic watersheds, and (c) exploring multi-decadal trends in retrogressive thaw slumping and coastal erosion along Kugmallit Bay, particularly in key sites identified by the Tuktoyaktuk Hunters and Trappers Committee.

The ARI's STEM Outreach Program removes financial and regional barriers to STEM education for communities across the Northwest Territories by offering a variety of delivery methods, including school visits, after-school programs, lending gear, creating resources for educators, and hosting community events. The photo here shows a recent outreach event, "Science Rendezvous," by Kelly Kamo McHugh.

More information is available through the Aurora Research Institute website (link).

Humphries, J.K., van der Sluijs. J., Morse, P.D., Kokelj, S.V. 2024. Embankment evolution of a gravel road on permafrost terrain five years after construction: the Inuvik-Tuktoyaktuk Highway in Conference Proceedings for the International Conference on Permafrost, June 16-20, 2024, Whitehorse, YT. https://www.nwtgeoscience.ca/services/northwest-territories-thermokarst-mapping-collective

Surveys on Distresses of Traffic Engineering in Degrading Permafrost on the Qinghai-Tibet Plateau

By Guoyu Li, Qingsong Du, Dun Chen, Minghao Liu, and Lin Chen (State Key Laboratory of Cryospheric Science and Frozen Soil Engineering, Northwest Institute of Eco-Environment and Resources, China), Fujun Niu (Shanghai Normal University, China), & Mingtang Chai (Ningxia University, China)

A 5-year research project was funded by Ministry of Science and Technology of the People's Republic of China, aiming to understand the spatial distribution, development patterns, influencing factors, types and formation mechanisms of the distresses of the pavement and road embankment induced by permafrost thawing and freeze-thaw cycles along three engineering corridors, the Golmud-Lhasa Corridor, the Gonghe-Yushu-Lhasa Corridor and the Yecheng-Lhasa Corridor on the Qinghai-Tibet Plateau (QTP).

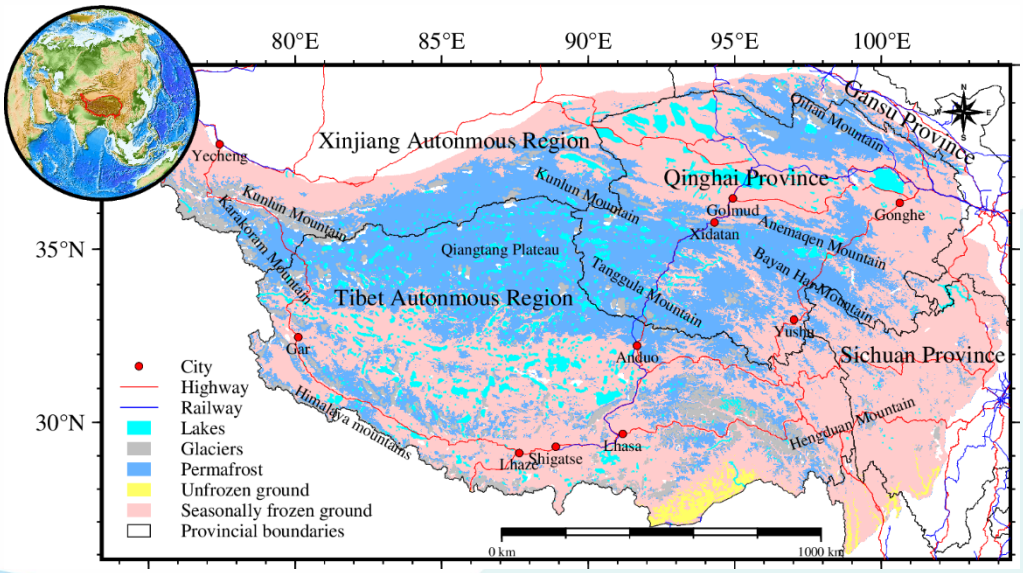
The findings will provide experiences and lessons for decision-making, planning, design, and construction and maintenance of the running or future engineering projects on the QTP.

The project started in October 2022. It utilized advanced survey and statistical methods such as GPR, drones, Remote Sensing (InSAR), AI, as well as traditional ground temperature monitoring and field surveys to obtain various data about permafrost characteristics and distresses of pavement and road embankment. Some important results have been got as follows:

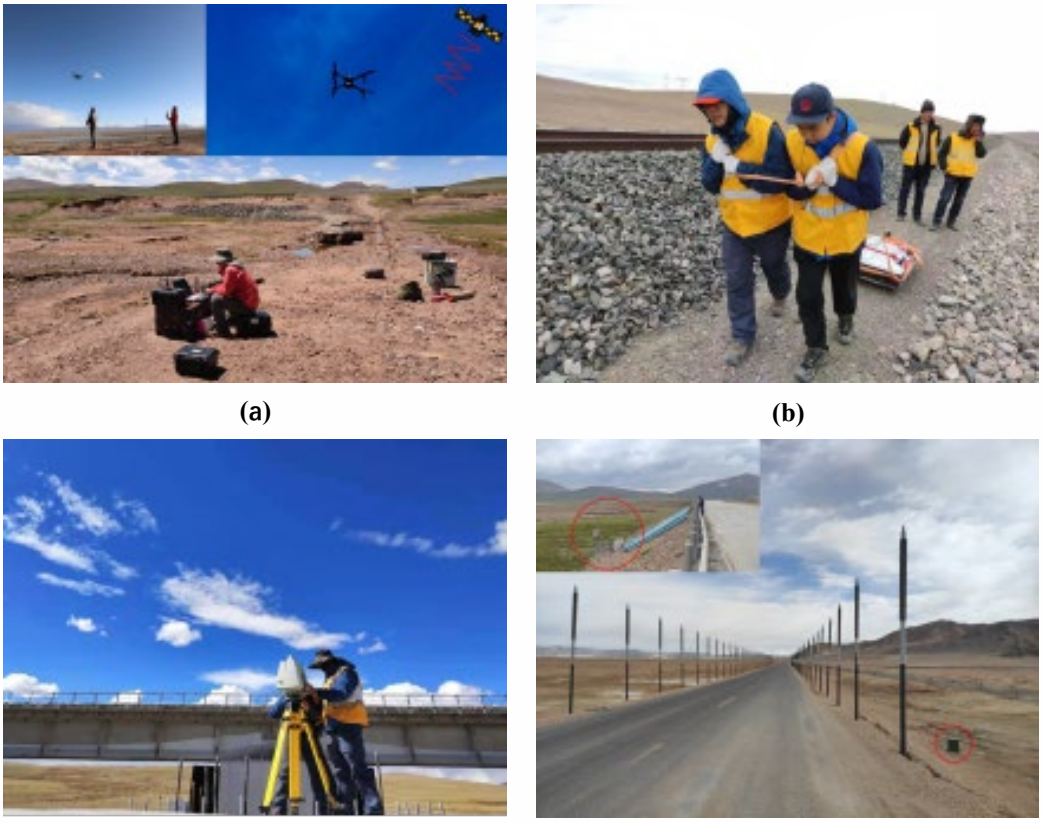
(1) The study revealed significant regional differences of the distress risk along the Golmud-Lhasa Corridor (including the Qinghai-Tibet Railway and Highway). 5.59% of the Qinghai-Tibet Highway exhibited a high probability (>50%) of distress occurrence, and 78% of railway embankments fell in the low probability, showing the effectiveness of cooling technologies adopted in the railway.

(2) Along the Gonghe-Yushu-Lhasa Corridor, the underlying permafrost exhibited remarked difference in thermal stability. Stable permafrost accounted for merely 0.4% of the route, sub-stable conditions account for 14%, transitional permafrost for 53%, and unstable permafrost for 33%, showing a high risk for engineering distress in the corridor.

(3) The Yecheng-Lhasa Corridor exhibited seven types of pavement distress. The road sections with the best conditions accounted for 28.9% of the route, reasonable conditions 51.5%, and bad conditions 17.8%.



Geographical distribution map of traffic engineering on the Qinghai Tibet Plateau



(a) (b) (c) (d)

Pavement distress investigation methods (a) drone flights, (b) GPR detection, (c) three-dimensional terrain scanning, and (d) ground temperature monitoring.

PROJECTS

Permafrost Discovery Gateway

By Anna Liljedahl & Emily Longano (Woodwell Climate Research Center)

The Permafrost Discovery Gateway (PDG) is a free, interactive web platform for users to share, engage, and create with pan-Arctic permafrost map data. The PDG is hosted by the Arctic Data Center, which archives all Arctic research funded by the National Science Foundation. Big geospatial data can be difficult to explore because of its size (think pan-Arctic coverage down to the sub-meter scale), yet so valuable for bridging field- to regional scale studies and in assisting land management and infrastructure planning. We created the PDG to help researchers and people living and working in the Arctic region access big permafrost map data and also to create new map products. Funding was originally from the National Science Foundation and more recently through Google.org. The development team includes over 20 people (most are working part-time on the PDG) who are spread across eight US states, Canada, Germany, and England.

The PDG is far from finished! We have initial big map data available for people to explore such as Alaska infrastructure and a large portion of the ice-wedge polygon map (product development led by Chandi Witharana, University of Connecticut), while our list of (big and small) map data to add is over 70 items long and growing. We had great help from 12 full-time Google Fellows for six months in 2024, resulting in a new design and features, including a data download tool so users can grab smaller areas of interest from the big data. In addition to improving the front-end user experience, we are optimizing and automating workflows aimed for a) event- and feature detection from satellite imagery, b) ingestion of new data layers to the PDG, and c) generation of derived statistical products. Longer-term, we envision incorporating more AI tools to support the user experience and to help connect people and data (think "matchmaking" over a common interest), and to incorporate more different types of data. Everything

we've built is open-sourced. Some highlights of this past year include: Over 300 people joining us on our monthly PDG webinar series; the publication of Permafrost thaw-related infrastructure damage costs in Alaska are projected to double under medium and high emission scenarios, and a three-day event in Fairbanks in May 2024 that brought together most of the development team for the first time, including Google Fellows and local collaborators. The gathering included a precious tour to the CRREL Permafrost Tunnel hosted by Tom Douglas. In addition to several conference presentations, we made a "PDG booth" tour at four Alaska conferences that all had scientists in minority. Our goal was to learn more from Alaska communities, tribes, service providers, local and state governments on what permafrost data is important and how to provide data access. The virtual tour of the CRREL permafrost tunnel was a big hit and everyone who had experience with a visit to the actual tunnel was eager to share what the tunnel smells like.

The PDG end-user workshop in Fairbanks May 2024 with many of the developers, including the 12 Google Fellows.

PDG development team on a precious tour of the CRREL Permafrost Tunnel, May 2024.

The PDG workshop in May 2024 included a field tour of local permafrost features, such as the degraded ice-wedges on the University of Alaska Fairbanks campus.

ESA Climate Change Initiative

By Annett Bartsch (b.geos, Austria) & Tazio Strozzi (Gamma Remote Sensing, Switzerland)

The project is currently in its second phase (2022-2025). The fifth version of the climate data records of Mean Annual Ground Temperature (MAGT) and Active Layer Thickness (ALT) for the northern hemisphere extending to 2023 is in preparation and will be released in 2025 (University Oslo, CryoGrid model). It integrates a novel circumarctic 10m land cover map based on data from the Copernicus Sentinel-1 and Sentinel-2 missions which has been specifically developed to support model parameterization. The first full version of the land cover map for all area north of the treeline was released open access in 2024.

Further rock glacier inventories (RoGIs) are being compiled in eight new regions in the Alps, the Himalayas, the Andes and Mongolia in cooperation with the IPA action group 'Rockglacier inventories and kinematics' (RGIK). The steps towards a standardised and consistent approach for calculating Rock Glacier Velocity (RGV) based on InSAR are consolidated in a round-robin process involving several groups. First RGV InSAR time-series were calculated for more than 20 landforms in the Alps.

ITCH workshop at Tollboden and Biologen Drøbak, Oslo, Norway, 21-25th of October 2024 (Photograph by Sebastian Westermann)

Two workshops were organized in 2024. The first one took place on 5th of September 2024 as part of the European Polar Science Week in Copenhagen. General requirements for ground temperature modelling and validation were presented and various results obtained from space-borne studies of permafrost in the Arctic were discussed. The series of presentations documented the rapid advances in permafrost studies from space, including modeling and in-situ observations. It was highlighted in the discussion that validation of the Permafrost_cci Phase II products could be successfully completed using international (GTN-P) and national monitoring networks. The second workshop 'ITCH – It's The CryoGrid Hackathon' (21-25 Oct 2024, Tollboden and Biologen Drøbak, Oslo, Norway) focused on permafrost modelling with the participation of 32 researchers. The ITCH has established itself as a meeting platform for the European permafrost modeling community. It is mainly driven by early-career researchers who have adopted the CryoGrid community model as a joint simulation tool for their research. During the workshop, group work was conducted on using novel machine learning techniques to transfer the results of physically-based permafrost models in space which holds significant potential to speed up permafrost mapping, as well as to improve the spatial resolution of the resulting maps.

Robert van Everdingen (1930-2024)

Robert Van Everdingen passed away in January 2024 at the age of 93 years. He was born in Utrecht, Netherlands. Robert was employed as a geologist with the Government of Libya (1960-1962), as a hydrogeologist with the Geological Survey of Canada (1962-1966), a research scientist with Environment Canada (1962-1986) and as a private consultant after 1986. He was a hydrogeologist and permafrost specialist, with several contributions on cold-region groundwater hydrology and applied geochemistry. He contributed actively to the IPA and was

Chair of the Working Group on Terminology and editor of the well-known "Multi-Language Glossary of Permafrost and Related Ground-Ice Terms", first published in 1998 and updated in 2002. He attended six International Conferences on Permafrost. In 2010 he was awarded the Robert N. Farvolden Award by the Canadian Chapter of the International Association of Hydrogeologists and the Canadian Geotechnical Society for the content and integrity of his scientific contributions to the hydrogeology and aqueous geochemistry of Western Canada and to the hydrogeology of permafrost. He was particularly well-known in Canada for his research on frost blisters in the Mackenzie Valley, N.W.T., and icings in the Kluane Front Range, Yukon.

Sergey Marchenko (1963-2024)

Dr. Sergey Marchenko passed away in Fairbanks in June 2024. He was a Research Associate Professor and member of the Snow, Ice and Permafrost Group at the Geophysical Institute of the University of Alaska - Fairbanks. Since 2011 he was also a Visiting Professor at the Chinese Academy of Science (CAS) at SKLFSE, the Cold and Arid Regions Environmental and Engineering Research Institute (CAREERI). Sergey obtained his Ph.D. in Geocryology and Glaciology from Moscow State University in 2000 and his masters in Mathematical Methods in Geology from the same university in 1991. He worked as an engineer-programmer at the Research Institute of Mechanics in Almati, Kazakhstan from 1985 to 1989, then as an engineer at the Yakutsk Permafrost Institute for the following 10 years, he was Senior scientist at

the Kazakhstani Alpine Permafrost Laboratory of the Yakutsk Permafrost Institute - now the Melnikov Permafrost Institute of the Siberian Branch of the Russian Academy of Sciences. In 2003 he began his career at the UAF as a visiting research scholar and became research associate professor in 2008. Sergey's research interests focused on climate-permafrost interactions and the influence of permafrost on ecosystem, landform and landscape development especially involving ground ice and the spatial numerical modelling of permafrost. He had more than 30 years of fieldwork, including the study of permafrost in the Tien Shan mountains and on the Qinghai-Tibet Plateau. He was an active member of the IPA, with involvement in several Action Groups and as Co-chair of the Working Group on Mapping and Modelling of Mountain Permafrost from 2003 to 2008, and participated in six ICOPs. He was a collaborator and data contributor to the international CALM and GTN-P networks.

The International Permafrost Association

The mission of the International Permafrost Association is to promote research in permafrost and permafrost-related fields within the global scientific and engineering communities, to support the activities of researchers in these disciplines, and to disseminate findings concerning permafrost to decision-makers, the general public, and educators.

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